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AUTHOR(S):

Kajiwara, Mitsuru; Inoue, Katsumi; Mutaguchi, Kazuaki; Usui, Tsuguru

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THE PREVALENCE OF OVERACTIVE BLADDER AND NOCTURNAL ENURESIS IN JAPANESE EARLY ADOLESCENTS: A QUESTIONNAIRE SURVEY

Mitsuru KAJIWARA[1], Katsumi INOUE[2], Kazuaki MUTAGUCHI[3] and Tsuguru USUI[1]

[1]*The Department of Urology, Division of Frontier Medical Science, Programs for Biomedical Research, Graduate School of Biomedical Sciences, Hiroshima University*

[2]*The Department of Urology, Miyazaki University*

[3]*The Department of Urology, Nakatsu Daiichi Hospital*

To assess the prevalence of overactive bladder (OAB) and nocturnal enuresis (NE) in early adolescents, we distributed an anonymous questionnaire about urinary symptoms to 624 middle school students aged 13 and 15 years. The questionnaire included items regarding age, gender, past and present diseases, urinary symptoms and bowel habits. OAB was defined as symptoms of increased daytime frequency occurring more than eight times during the daytime and/or urge incontinence occurring at least once a month. The overall response rate to the questionnaire was 32.4%, and the mean age ± SD of all respondents was 13.9 ± 0.89 years. The prevalence of OAB was 15.3% of all respondents (95% CI, 10.4-20.3% ; 4.2-16.1% of boys and 12.5-28.3% of girls). The prevalence of OAB decreased with age from 17.6% of respondents aged 13-year-olds to 11.8% of 15-year-olds. The mean daytime frequency was 5.0 ± 2.2 times. Increased daytime frequency was found in 10.4% (95% CI, 6.2-14.6% ; 2.7-13.5% of boys and 6.1-19.0% of girls) and nocturia in 4.0% (95% CI, 1.3-6.7%). The prevalence of NE was 3.0% (95% CI, 0.65-5.4% ; three boys and three girls). The results of this study demonstrate that some early adolescents had OAB or NE. Further large-scale studies would be required to investigate the prevalence and natural history of OAB and NE.

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Key words: Overactive bladder, Adolescent, Nocturnal enuresis, Prevalence

INTRODUCTION

Symptoms of overactive bladder (OAB) such as urgency and increased daytime frequency with/without urge incontinence are common in middle-aged and older adults. It is also known that urge incontinence is not uncommon in children. However, there are only some published epidemiological studies on the prevalence of OAB in adolescents[1,2]. Recent reports suggest that some cases of nocturnal enuresis (NE) in childhood persist into adulthood[3], but to our knowledge, there are no reports about OAB and NE in adolescents in Japan.

An epidemiological survey was therefore carried out to assess the incidence of OAB and NE in Japanese junior high school students.

MATERIALS AND METHODS

A total of 624 students, aged 13-15 years, attending two junior high schools in Hiroshima prefecture were enrolled in the survey carried out between July and September 2001. The questionnaire about urinary symptoms was developed from mainly the International Consultation on Incontinence Questionnaire[4] and other validated questionnaires. The questionnaire included questions regarding age, gender, past and present diseases, urinary symptoms such as daytime frequency of micturition, nocturia, urge or stress incontinence, NE and bowel habits. A self-administered questionnaire and a package insert which explained the aims of the investigation were distributed to all subjects and their parents via their school classrooms. After completion at home anonymously, the questionnaires were collected at school and sent to our department for analysis. Great care was taken to ensure confidentiality.

In the survey, OAB was defined as symptoms of increased daytime frequency and/or urge incontinence. Respondents who urinated more than eight times during the daytime were defined as having increased daytime frequency and those who urinated less than three times were defined as having infrequent daytime voiding. Daytime urinary incontinence (DUI) was defined as involuntary leakage of urine during the daytime at least once a month, and NE as involuntary leakage of urine during sleep occurring more frequently than once per month. Respondents who had bowel movements less than two or three times per week were defined as having infrequent bowel movements.

The Statview program was used for data entry. Statistical analyses were done using the Mann-Whitney U test, Student's t-test and the Chi-square test with $p < 0.05$ considered statistically significant.

RESULTS

Data were collected from 33.7% of the 624 subjects.

No respondents with present or past neurological diseases were found. Eight respondents (four boys and four girls) who did not complete the questionnaires were excluded. A total of 99 boys and 103 girls completed the questionnaires with an overall response rate of 32.4% (92, 59 and 51 respondents were 13, 14 and 15 years of age, respectively). The mean age of all respondents was 13.9±0.89 years.

1. Prevalence of OAB

The overall prevalence of OAB was 15.3% of all respondents (95% confidence interval, 10.4-20.3%). OAB was more common among female respondents than male respondents (95% CI, 4.2-16.1% of boys and 12.5-28.3% of girls). The prevalence of OAB decreased with age from 17.6% of 13-year-old respondents to 11.8% of 15-year-old (Fig. 1). Increased daytime frequency was the most common symptom (67.7%), followed by urge incontinence (38.7%) or both (6.5%).

2. Daytime frequency of micturition and nocturia

Marked variability was found in daytime frequency of micturition (Fig. 2). The range of daytime frequency was two to 14 times with a mean daytime frequency of 5.0±2.2 times (4.8±2.2 times in boys vs. 5.2±2.1 times in girls). Increased daytime frequency was found in 10.4% of respondents (95% CI, 6.2-14.6%; 2.7-13.5% of boys and 6.1-19.0% of girls). Infrequent daytime voiding was found in 7.9% (95% CI, 4.2-11.7%). Infrequent daytime voiding was more common among boys than girls (5.6-18.6% of boys and 0.13-7.7% of girls). Nocturia occurring every night occurred in 4.0% (95% CI, 1.3-6.7%; four boys and four girls). Of the eight respondents with nocturia, six (75%) had OAB during the daytime; one boy had urge incontinence and the other five (two boys and three girls) had increased daytime frequency.

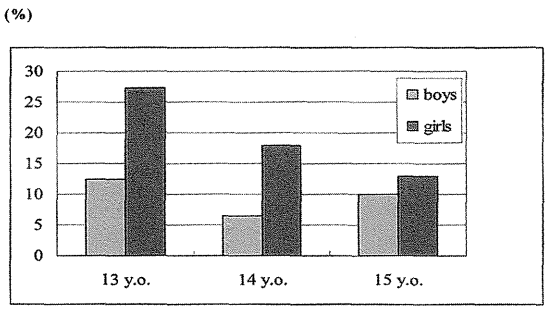

Fig. 1. The prevalence of OAB in all respondents—by age and gender—.

3. Prevalence of NE

NE was detected in 3.0% of all respondents (95% CI, 0.65-5.4%; three boys and three girls). Of the six respondents with NE, severe NE occurring more than once per week was found in four (three boys and one girl). The prevalence of NE decreased with age (5.4% of respondents aged 13-year-old, 1.7% of 14-year-olds and 0% of 15-year-old). Monosymptomatic NE was detected in three individuals (two boys and one girl). The other three had both NE and OAB; one boy had urge incontinence and two girls had increased daytime frequency.

4. Prevalence of DUI

The overall prevalence of DUI was 9.4% (95% CI, 5.4-13.4%). DUI was more common in female respondents than in boys (95% CI, 0-6.4% of boys and 8.4-22.6% of girls). In male respondents, DUI was classified as urge incontinence. In female respondents, various types of DUI were present: coughing, exercise and urgency were the most common causes. In the 16 girls with DUI, six respondents (37.5%) had stress incontinence alone, five (31.3%) had mixed incontinence, four (25.0%) had urge incontinence alone, and one reported that she wet herself unknowingly. When mixed incontinence was included in the diagnosis of stress incontinence, stress-related incontinence was found in 10.7% of all girl respondents.

5. Bowel habits

Infrequent bowel movements were experienced by 33.7% of the respondents (95% CI, 27.2-40.2%). Infrequent bowel habits were more common in female respondents than male respondents (95% CI, 15.1-31.9% of boys and 33.9-53.3% of girls).

6. Association between OAB and nocturia, and between OAB and bowel movements

With regard to the association between OAB and nocturia, nocturia was found in 19.4% (6/31) of respondents with OAB and in 1.2% (2/171) of

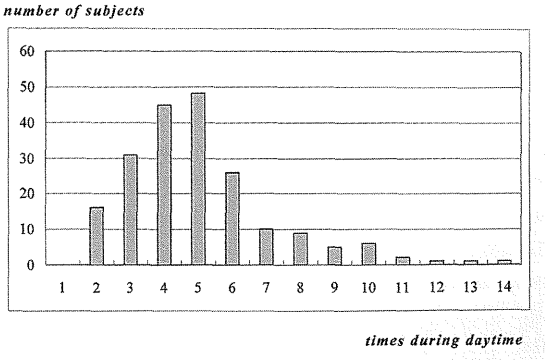

Fig. 2. Daytime urinary frequency of micturition in all respondents.

Table 1. The mean daytime frequency of micturition, the prevalence of nocturia and infrequent bowel movements in early adolescents with/without OAB

	Respondents with OAB (n=31)	Respondents without OAB (n=171)	p Value
The mean daytime frequency of micturition (times)	8.1±3.2	4.4±1.3	p<0.001
Prevalence of nocturia	19.4% (6/31)	1.2% (2/171)	p=0.001
Prevalence of infrequent bowel movements	41.9% (13/31)	32.1% (54/168)	p=0.3929

respondents without OAB; this difference was statistically significant (p=0.001). With regard to the association between OAB and bowel movements, infrequent bowel movements were reported by 41.9% of respondents with OAB (13/31 : 30.0% of boys vs. 47.6% of girls) and by 32.1% of respondents without OAB (54/168 : 22.7% of boys vs. 42.5% of girls) ; this difference was not statistically significant (p=0.3929) (Table 1).

DISCUSSION

Many epidemiological studies have been performed to investigate NE in children. The prevalence of NE occurring at least once per month has been reported to be >10% among 6-year-old and about 5% among 10-year-old[5]. The incidence of NE generally decreases with age. However, this recovery is by no means complete. A recent study in the Netherlands reported that 0.5% of 13,081 healthy adults aged 18–64 years wet their beds regularly[6]. However, there are not many published epidemiological studies on NE in adolescents. The prevalence of NE occurring more than once per month was reportedly 2.1% in boys and 1.2% in girls aged 13–14 years[7] and 1.3% in 13–15-year-old[8]. In adolescents with NE, 71% had monosymptomatic NE and up to 74% had primary NE[3]. The current study showed that NE was detected in some Japanese early adolescents, with a predominance of respondents in the 13-year-old age group, and that 50% of the cases with NE had monosymptomatic NE.

With regard to urinary symptoms in adolescents, available epidemiological data are also scarce. In adolescents, DUI was observed more frequently among girls than among boys in the same age group, and the prevalence decreases with age[9]. In children, the main type of DUI was urge incontinence in both genders[10]. In the current study, girl respondents had a statistically higher prevalence of DUI and the type of incontinence was quite different from that in boys. Moreover, the results revealed the presence of girls with stress-related incontinence. It was not possible to define whether stress incontinence or provoked detrusor instability was the cause of the leakage of urine associated with exercise, effort, coughing and laughing, but similar results about the existence of stress incontinence in children and young adults have been reported previously[10,11]. These studies showed that stress incontinence was present in 5.9% of females aged 15–24 years. More attention should be paid to stress incontinence in early adolescents, because the prevalence might be higher than expected in adolescent girls.

The mean daytime frequency has been reported to be 3.4 times among 11–12-year-old and 4.2 times among subjects aged 15–16 years[9]. The current data support this report. A large-scale survey in 16,776 healthy adults showed that the overall prevalence of OAB was 16.6% among the total respondents (15.6% of men and 17.4% of women) and increased with age[12]. In our study, the prevalence of OAB was 15.3% and increased daytime frequency was the most commonly detected symptom of OAB. On the other hand, it has been reported that infrequent daytime voiding was prevalent in 7.7% of women aged 20–45 years, and that urinary tract infections were significantly more common in infrequent voiders[13]. More attention should be paid to the daytime frequency of micturition because increased daytime frequency must be a troublesome problem and infrequent daytime voiding might be linked to urinary tract infections.

Bowel regularity in adolescents is also poorly understood. Previous studies showed that 87.5% of 11–12-year-old and 90.1% of 15–16-year-old have bowel movements at least every other day[9]. In the 15–16-year-old group, a greater proportion of girls than boys had less frequent bowel movements; this difference was statistically significant (p<0.001, 95% CI 3.8–11.2%). The results of this study support these findings. Constipation is assumed to be one of the causes of detrusor instability. An association between urinary symptoms and bowel dysfunction has been reported in children[10] and in the elderly[3]. However, the current results did not demonstrate a significant link between infrequent bowel habits and OAB.

The major drawbacks of this study were a lack of questions about urgency and low response rate. A question about urgency was not included in our questionnaire because of the difficulty for adolescents in realizing the ideas of urgency as well as in expressing the severity, which might cause a low response rate. The low response rate might introduce bias into the investigation and might make it impossible to conclude regarding the precise prevalence of OAB and NE. However, our results showed no significant difference between respondents and non-respondents in age (13.9 ±0.89 vs. 14.0±0.79 years ; p=0.4163). A comparison showed no significant difference between respondents and non-respondents in sex ratio (boys/girls ; 99/103 vs.

207/215, respectively). The results demonstrate that some early adolescents have increased daytime frequency, urge incontinence or NE, and suggest a possible link between OAB, NE and nocturia. To better understand the prevalence and natural history of OAB and NE, and the link between OAB and other symptoms, further large-scale studies would be required involving more schools from a wider geographical area.

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和文抄録

本邦中学生の過活動膀胱，夜尿症に関する疫学調査

梶原　充[1]，井上　勝己[2]，牟田口和昭[3]，碓井　亞[1]
[1]広島大学大学院医歯薬学総合研究科創生医科学専攻先進医療開発科学講座腎泌尿器科学，
[2]宮崎大学医学部泌尿器科，[3]中津第一病院泌尿器科

本邦中学生における過活動膀胱（OAB），夜尿症の罹患率を調査することを目的とし，広島県内の2つの中学校に在籍する全生徒624名を対象とした排尿症状に関する匿名アンケート調査を施行した．質問事項は年齢，性別，既往歴，排尿症状および排便症状．なお，OAB は頻尿（昼間8回以上）または切迫性尿失禁（月1回以上）と定義した．回答率は32.4％で，平均昼間排尿回数5.0±2.2回（2～14回），頻尿10.4％，夜間頻尿4.0％であった．OAB，夜尿症の罹患率はおのおの15.3％（95％信頼区間10.4～20.3％），3.0％（95％信頼区間0.65～5.4％）でいずれも年齢とともに減少した．また，OAB の19.4％に夜間頻尿を認めた．中学生においても OAB，夜尿症が認められ，さらなる調査が必要であると考えられる．

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